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ABSTRACT

In recent years, concern in the United States over continuing competitive advances by Japan in science and technology has increased. To respond to these concerns, several federal agencies and private sector organizations have increased efforts to monitor Japanese science and technology developments. This report describes and analyzes some of these activities and discusses areas where the federal government may have a role in the future. The document recognizes the potential of the Japanese Technical Literature Act (Public Law 99-382) to significantly improve and coordinate federal efforts. The activities of those federal agencies already involved in monitoring Japanese progress are outlined. These include actions taken by: (1) the Japanese Technology Evaluation Program (a joint effort between the Commerce Department and the National Science Foundation); (2) the Office of Science and Technology Policy; (3) the National Science Foundation (Division of International Programs); (4) the National Technical Information Service; (5) the Foreign Broadcast Information Service; (6) the Department of Defense; and (7) the New Commerce Department Program (as mandated by Public Law 99-382). Recent efforts by organizations in the public sector are also described. (TW)

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JAPANESE SCIENCE AND TECHNOLOGY: SOME RECENT EFFORTS TO IMPROVE U.S. MONITORING

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ABSTRACT

In recent years, concern in the United States over continuing competitive advances by Japan in science and technology has increased. To respond to these concerns, several Federal agencies and private sector organizations have increased efforts to monitor Japanese science and technology developments. Further, in 1986, Congress passed the Japanese Technical Literature Act [P.L. 99-382] to improve U.S. access to Japanese scientific and technical information. This report describes and analyzes these activities and discusses areas where the Federal government may have a role in the future.

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SUMMARY

In recent years, concern in the United States over continuing competitive advances by Japan in science and technology has increased. Increasingly, the Japanese are shedding their "copycat" image in many areas of science and technology and are building a reputation as innovators. A significant component of Japan's efforts to improve its capacity for innovation is the monitoring of U.S. technical developments by such means as reviewing technical literature, attending U.S. scientific meetings, and studying at American universities. By contrast, similar monitoring activities of Japanese technology by U.S. scientists and researchers is less extensive. Given the slippage in U.S. dominance of world science and technology, many observers claim that the United States needs to exert greater efforts to monitor Japanese activities and to acquire, translate, and disseminate associated literature.

In recent years, several Federal agencies have increased efforts to monitor Japanese science and technology. Among these efforts are the Japanese Technology Evaluation program and the review of the U.S.-Japan Agreement on Cooperation in Research and Development in Science and Technology. Further, in 1986, Congress passed the Japanese Technical Literature Act [P.L. 99-382] to improve U.S. access to Japanese scientific and technical information. The law establishes within the Department of Commerce a program which among other tasks is to: (1) monitor Japanese technical activities and developments; (2) acquire and translate selected Japanese technical reports and documents; and (3) coordinate with other agencies and departments of the Federal Government to

identify gaps and avoid duplication in Federal efforts to acquire, translate, index, and disseminate Japanese technical information. In addition, several private organizations--such as the Semiconductor Research Corporation, the American Electronics Association, and the Microelectronics and Computer Technology Corporation--have instituted initiatives to improve surveillance of Japanese science and technology.

Perhaps the most significant of the Federal efforts is the new Commerce Department program mandated by the Japanese Technical Literature Act. The provisions of the law have the potential to significantly improve and coordinate Federal efforts in this area. It will be important, however, for Congress to provide continuing oversight to ensure that the Department does not lag in implementing the law and to determine the effectiveness of the program and whether greater funding is needed.

Since these efforts are relatively new, it is not possible to fully assess their value or success. Collectively, these programs represent a significant stride toward improving U.S. surveillance of Japanese science and technology. There are still areas, however, where an increased Federal government role could be considered in overcoming barriers to monitoring Japanese science and technology and acquiring related literature. In particular, for the long-term a case can clearly be made for stimulating Japanese language study by science and engineering students and to provide greater opportunities to students and researchers for travel and study in Japan. In the short-term, Federal agencies could weigh the benefits of greater efforts to disseminate existing data on Japanese science and technology to a broader audience. In addition, Federal agencies need to coordinate the various Japanese monitoring activities to avoid duplication and to ensure that the greatest benefit is derived from limited resources.

JAPANESE SCIENCE AND TECHNOLOGY: SOME RECENT EFFORTS TO IMPROVE U.S. MONITORING

I. INTRODUCTION

In recent years, concern in the United States over continuing competitive advances by Japan in science and technology has increased. For example, in the area of semiconductors, Japan now controls 67 percent of the $1.65 billion-a-year world market for dynamic-random-access-memory chips. In addition, Japan currently is a world leader in developing gallium arsenide, a material which enables production of chips to process information almost ten times faster than silicon chips.[1]

Increasingly, the Japanese are shedding their "copycat" image in many areas of science and technology and are building formidable a reputation as innovators. A significant component of Japan's efforts to improve its capacity for innovation is the monitoring of U.S. technical developments by means such as reviewing technical literature, attending U.S. scientific meetings and studying at American universities. By contrast, similar monitoring activities of Japanese technology by U.S. scientists and researchers is far less extensive. Given the slippage in U.S. dominance of world science and technology, many observers claim that the United States needs to exert greater efforts to monitor Japanese technical activities and to acquire and disseminate associated literature.

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[1] Bylinsky, Gene. The High-Tech Race: Who's Ahead? Fortune, v. 114, Oct. 13, 1986. p. 30.

In 1986, Congress responded to these concerns by passing S. 1073, The Japanese Technical Literature Act [P.L. 99-382]. The goal of the law is to improve U.S. access to Japanese scientific and technical information. The law establishes within the Department of Commerce a program which among other tasks is to: (1) monitor Japanese technical activities and developments; (2) acquire and translate selected Japanese technical reports and documents; and (3) coordinate with other agencies and departments of the Federal government to identify gaps and avoid duplication in Federal efforts to acquire, translate, index, and disseminate Japanese technical information. [See Section II(G) for further discussion of the new Commerce Department program.]

In 1984, the Congressional Research Service (CRS) wrote a report entitled The Availability of Japanese Scientific and Technical Information in the United States.[2] Included in the report are descriptions of selected U.S. efforts in the public and private sectors to monitor Japanese science and technology developments and to acquire the related literature. To assist in Congressional oversight of The Japanese Technical Literature Act, this report updates the information in the 1984 CRS study by describing some recent activities by Federal agencies and the private sector.

II. SELECTED FEDERAL EFFORTS TO MONITOR JAPANESE SCIENCE AND TECHNOLOGY

Several Federal agencies recently have expanded their efforts to monitor these developments. Among these programs are the following.

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[2] U.S. Congress. House. Committee on Science and Technology. The Availability of Japanese Scientific and Technical Information in the United States. [Report prepared by CRS for the Subcommittee on Science, Research and Technology] 98th Cong., 2d Sess., Nov. 1984. Washington, U.S. Govt. Print. Off., 1984. 29 p.

A. Japanese Technology Evaluation Program (JTECH)

In response to continuing advances by Japan in selected high-technology areas, in 1984 the Commerce Department and the National Science Foundation (NSF) initiated the JTECH program. Under this program, panels comprised of technical experts from industry, government, and academia assess the state-of-the art of Japanese technology as well as trends in Japanese capabilities compared with the United States. The contractor to the project is Science Applications, Inc.

Four reports have been completed in Phase I of the JTECH program. These studies covered the areas of computer science, nonsilicon microelectronics, robotics, and biotechnology. Last year, NSF and the Defense Advanced Research Projects Agency (DARPA) of the Department of Defense began sponsoring Phase II of the JTECH project. Reports on telecommunications and advanced materials are finished, while a study on advanced computing is still in progress. Reports are publicly available through the National Technical Information Service (NTIS) of the Commerce Department. In addition, key professional journals have summarized the findings of the JTECH studies. Currently, NSF is negotiating with DARPA for approval of funding for several Phase III reports. Possible topics include: electrical power generation; magnetic/optical memories; commercial applications of space; science and engineering education; and computer hardware.[3]

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[3] Telephone conversation with George Hazelrigg, NSF, Nov. 10, 1986.

B. Review of United States-Japan Agreement on Cooperation in Research and Development (R&D) in Science and Technology

Currently, the Office of Science and Technology Policy (OSTP) is reviewing the 1980 United States-Japan Agreement on Cooperation in R&D in Science and Technology through a working group of the Federal Coordinating Council for Science, Engineering, and Technology Committee on International Science, Engineering, and Technology (CISET). Specifically, the CISET Working Group on International Science, Engineering, and Technology Education, Infrastructure, and Facilities--chaired by John Moore, Deputy Director of NSF--is considering a recent draft report on how to restructure the agreement to increase its effectiveness when it comes up for its second renewal in 1987. The draft report discusses priority areas to be covered as well as how to improve the management system of the agreement. The working group hopes that these proposals will set a standard for the other 18 to 20 agreements with Japan to make them more organized and meaningful.[4]

C. National Science Foundation

The Division of International Programs at NSF currently is organizing a new unit to expand existing efforts to collect, analyze, and disseminate information on foreign science and technology developments. The new unit represents a reorientation of existing resources and funds. The program plans to emphasize increased reporting from the NSF offices in Paris and Tokyo along

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[4] Telephone conversation with Donald Jameson, State Department, Nov. 4, 1986, and William Blanpied, NSF, Dec. 15, 1986. The draft report was written by Justin Bloom and revised by members of the Joint Task Force on U.S.-Japan, Bilaterial Science and Technology Relations. Members of the Joint Task Force include William Blanpied (NSF), Donald Jameson (State Department) and John Williams (Commerce Department). The study has not been approved or released by OSTP.

with electronic dissemination of reports from NSF staff and NSF-funded scientists who travel to Japan. In addition, the unit will conduct assessments of foreign science and technology capabilities and may arrange for translations of reports. NSF has increased staffing for the program and funding is estimated at $750,000. As a prelude to these expanded activities, NSF sponsored a workshop with the Office of Naval Research in October 1986 entitled, "Defining U.S. Needs to Monitor Foreign Science and Technology for Greater International Competitiveness."[5]

In addition, the NSF Division of Electronics, Communications, and Systems Engineering is establishing a new project as part of their grant activity to send young U.S. faculty members to Japan. Under the program, participants will receive language training and then will travel to Japan to work for one year in either university or corporate laboratories. Upon their return to the United States, they will receive funding for another year to continue their research. To date, the Division has arranged for one individual to travel to Japan in the spring of 1987. Funding will range from $75,000 to $100,000 per person.[6]

D. National Technical Information Service (NTIS)

The National Technical Information Service, part of the Commerce Department, continues to acquire Japanese scientific and technical reports through its Foreign Technology Acquisition Program. NTIS acquires material from Japan through a cooperative arrangement with Mitsubishi Research Institute which has contracted with one individual to identify sources of relevant technical reports. Currently, NTIS has acquisition arrangements with 20

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5 Telephone conversation with Carole Ganz, NSF, Nov. 14, 1986.

6 Telephone conversation with Frank Huband, NSF, Dec. 17, 1986.

Japanese organizations. Japanese documents, however, still represent a small percentage of the total number of foreign titles listed in the NTIS database. NTIS--which is required by law to be self-supporting--is limited in the number of Japanese reports it can accept because of the difficulty and expense in obtaining translations.

NTIS also has acquired access to the online database of the Japan Information Center of Science and Technology (JICST). NTIS is offering access to this international database to anyone who wants to search. To date, there has not been a large response since access to the database requires approximately $12,000 worth of equipment as well as someone who reads Japanese. Recently, however, NTIS gained access to the JICST English-language database which is a combination of citations and abstracts. Eventually, JICST hopes to provide all of its citations and abstracts in English.[7]

Recently, NTIS has entered into a cooperative arrangement with George Mason University (GMU) in a new program called the "Japanese Technical Information Research Service." Under this quid pro quo arrangement, NTIS supplies GMU with online access to the JICST database and provides for communications with their representative in Japan. In return, NTIS receives services from Japanese experts at GMU who can search and\or understand the JICST database as well as review papers, technical reports, and possibly serve as translators.[8]

The GMU program intends to market services to firms with 200 or more employees. Clients will receive services such as: identification of information needs; acquisition of Japanese technical documents; technical

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[7] Telephone conversation with David Shonyo, NTIS, Nov. 3, 1986.

[8] Ibid.

translations; and assessment of document quality and content. Translation work will be contracted out; the estimated cost for translating a 100-page report ranges from $2000 to $3000. The program has obtained funding from the Center for Innovative Technology, the U.S.-Japan Friendship Commission, and GMU to keep it operating for at least one year.[9]

According to NTIS, the cooperative program with GMU is too new to assess its potential value or impact. The agency views it as an opportunity to enhance its services.[10]

E. Foreign Broadcast Information Service

The Foreign Broadcast Information Service (FBIS) continues to publish the "Japan Report: Science and Technology" approximately three times per week. FBIS staff scan, select, and translate articles from approximately 250 Japanese publications. Typically, articles address Japanese government programs or policies or provide broad reviews of industrial technology developments. Articles from the primary science and technology literature are not included. The amount of material published in the Report in 1986 will be about 7000 to 8000 pages compared to 6000 pages in 1984. Most of the material in the Report is translated from Japanese copyrighted material and therefore, is restricted to U.S. Government use. Occasionally, however, special "yellow cover" issues containing uncopyrighted information are made available to the public through NTIS.[11]

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[9] Telephone conversation with Atsushi Akera, GMU, Nov. 3, 1986.

[10] Telephone conversation with David Shonyo, NTIS, Nov. 3, 1986.

[11] Presentation by Cyril Braegelman, FBIS, at Congressional Research Service on May 29, 1986.

F. Department of Defense

In 1984, the Defense Department released the report of the Defense Science Board (DSB) Task Force on Industry-to-Industry International Armaments Cooperation: Phase II-Japan.[12] The Task Force examined the need for increased technological cooperation on defense programs with Japan. The study found that technological cooperation between industries of the two countries could strengthen both defense forces and the overall relationship. Further, many of Japan's technologies are at least the equal of ours.[13] Among the actions recommended by the study to establish a national program of expanded technological cooperation were that the United States should: initiate a comprehensive program to rapidly translate key Japanese scientific/technical documents and relevant policy documents; and expand U.S.-Japan cooperation in basic research.[14]

In partial response to the DSB Task Force concerns and in support of the 1983 "Nakasone initiative,"[15] DOD has organized "technology teams" comprised of DOD scientists who visit Japan to observe progress by Japanese companies in certain technologies. A group concerned with electro-optics millimeter/microwave technology has visited Japan twice. It has released both a "confidential" report and an "unclassified" version of its findings and

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12 U.S. Office of the Under Secretary of Defense for Research & Engineering. Report of Defense Science Board Task Force on Industry-To-Industry International Cooperation: Phase II-Japan. Washington, June 1984. 142 p.

13 Ibid., p. 62, 67.

14 Ibid., p. 68.

15 In Jan. 1983, Prime Minister Nakasone of Japan announced that Japan would transfer military technology to the United States. This offer was formally consummated in an exchange of diplomatic notes between Japan and the United States on Nov. 8, 1983. DSB Task Force Report, p. 28.

observations.[16] DOD has distributed approximately 1000 copies of the unclassified report to groups such as trade associations and their members and hundreds of copies of the confidential report to defense contractors. In early 1987, another technology team is scheduled to travel to Japan to observe advanced manufacturing technologies.[17]

G. New Commerce Department Program

The Japanese Technical Literature Act assigned the Department of Commerce the responsibility for its implementation. Deputy Secretary of Commerce Clarence Brown temporarily appointed Kenneth Gordon of the National Bureau of Standards Director of the program and asked him to submit an implementation plan. Dr. Gordon has submitted a preliminary blueprint for the program and expects a final decision on the plan from Secretary Brown in December.[18]

In a recent speech at a conference sponsored by the Japan-America Society, Associate Deputy Secretary of Commerce Mark Policinski outlined several aspects of the new program.[19] The Department has decided to commit $1 million (the amount authorized to be appropriated in P.L. 99-382) to the effort which will be obtained by reprogramming from existing funded programs. In addition, Dr.

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16 U.S. Department of Defense. Office of the Under Secretary of Defense for Research and Engineering. Electro-Optics Millimeter/Microwave Technology in Japan. Washington, DOD, 1985. 45 p.

17 Personal meeting with Stephen Piper, Director, Armaments Cooperation Structural Development, Office of the Under Secretary of Defense for Research & Engineering, Dec. 9, 1986.

18 Telephone conversation with Kenneth Gordon, NBS, Nov. 19, 1986.

19 The Japan-America Society of Washington, D.C. The Second Symposium on U.S.-Japan Science & Technology Exchange: Patterns of Interdependence. Speech by Mark Policinski, Associate Deputy Secretary, Department of Commerce. Nov. 17, 1986. McLean, Va.

Gordon will report directly to Deputy Secretary Brown on the program's progress and will receive policy guidance from him. Associate Deputy Secretary Policinski also described specific tasks that tentatively have been identified as worthwhile to achieve the objectives of the Act. These include the following:[20]

- o Define and evaluate the various Federal activities already contributing to such information dissemination;
- o Convene a conference of these involved Federal groups to improve coordination and gain their further participation;
- o Survey non-Federal producers of such information that offer services to users;
- o Publish a directory of Federal sources of Japanese technical literature and related activities;
- o Help government and private users learn of the value of foreign technical developments and make use of available and expanded sources;
- o Identify significant gaps in U.S. coverage of Japanese technical literature and work to fill those gaps through U.S. or Japan-based activities;
- o Study the current status of computer-assisted translation of Japanese literature and its applicability to this problem;
- o Sponsor assessments or state-of-the-art reviews of Japanese literature on developments in selected technical areas; and
- o Increase information availability by providing seed money or other assistance in the start-up of new translation or dissemination services.

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20 Ibid.

III. SOME RECENT PRIVATE SECTOR EFFORTS

In recent years, several private sector organizations have established programs to improve surveillance of Japanese science and technology and associated literature. The extent of U.S. industry involvement in monitoring Japanese science and technology is difficult to ascertain since most activity is proprietary in nature. The activities listed below represent only a sampling of endeavors by private sector organizations. Excluded are programs carried out by individual firms for their own use.

A. Semiconductor Research Corporation (SRC)

SRC is a nonprofit research consortium whose 36 members support semiconductor research at U.S. universities. The Federal Government recently joined the consortium through a "memorandum of understanding" with NSF; participants include NSF, the Defense Department, and the National Security Agency. SRC periodically arranges for reports on Japanese developments in semiconductor technology from U.S. scientists visiting in Japan. An example of this was the "Frey Report from Japan," which was a series of newsletters in 1985 from Professor Jeffrey Frey, a SRC Investigator at Cornell University who was on sabbatical at the University of Tokyo. In addition, SRC also tries to obtain information from specialists who attend pertinent meetings in Japan. These data are distributed to the member companies of the Corporation.

SRC also has informally proposed a more comprehensive program to monitor Japanese science and technology. Funding for this endeavor would be obtained by pooling the monies currently being spent by each member company in this area. Such a program would reduce redundancy and overlap and increase efficiency. SRC feels that little of the data presently obtained by the member

companies is proprietary; thus, a consolidated effort would significantly benefit all members. Since SRC is limited in staff and funding, the proposal has not been formally organized or presented to the membership. In addition, SRC has considered establishing a Tokyo office.[21]

B. Microelectronics and Computer Technology Corporation (MCC)

MCC is a cooperative of 21 companies that provide funding for several areas of computer research at the MCC laboratories in Austin, Texas. MCC has two analysts--one of whom is fluent in Japanese--who monitor Japanese developments related to research efforts at MCC. The analysts scan Japanese technical literature and determine what needs to be translated. Translation work frequently is contracted out to Japanese students at the University of Texas. In addition, MCC's analysts travel to Japan approximately four times a year to meet with private companies and Japanese government officials.[22]

C. Japanese Technical Information Service (JTIS)

In 1985, the Japanese Technical Information Service of University Microfilms International began operating. The service abstracts and indexes 750 Japanese journals; 600 of these titles are not covered in any other generally available Western source. JTIS delivers 5000 abstracts and an index volume to subscribers monthly. The subscription cost is $5500/year except for libraries whose cost is $2750/year. JTIS also offers a translation and

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21 Telephone conversation with Robert Burger, SRC, Nov. 19, 1976.

22 Telephone conversation with Jan Vardaman, MCC, Nov. 13, 1986.

document delivery service. In April 1987, Dialog Information Services, Inc. will begin offering the service for on-line bibliographic searching.[23]

In the future, the JICST on-line database may prove to be a strong competitor to JTIS. For example, JICST has signed an agreement with Fachinformationzentrum Energie, Physik, Mathematik GmbH (FIZ Karlsruhe) and the American Chemical Society's Chemical Abstracts Service to link the three services together on the Scientific and Technical Network (STN). JICST computers in Tokyo will be linked by dedicated lines to Columbus, Ohio and Karlsruhe.[24] In addition, access to the JICST on-line information system and Japan's Patent On-line Information Service will be offered by the new U.S. office of a Japanese company called Meitec Corporation. Meitec will provide translations from these databases within 24 hours.[25]

D. American Electronics Association (AEA)

AEA is a trade association representing more than 2800 electronics and information technology companies in the United States. In 1984, AEA began their Japan Research Fellowship Program. Under this program, graduate engineering and computer science students are selected to receive intensive Japanese language training in the United States. This is followed by internships of nine months to one year in research laboratories of ten participating Japanese companies. The Japanese companies provide round-trip air transporta-

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23 Telephone conversation with Herman Baron, JTIS, Nov. 14, 1986.

24 Japan-Europe-USA Link. Information Market, Aug.-Nov. 1986, p. 8.

25 Cohen, Charles. Meitec to Open a Window on Japanese Technology. Electronics, v. 59, Nov. 13, 1986. p. 32.

tion, room and board in Japan, books and research materials, and a monthly living allowance.

Other support is supplied by funding from AEA's Electronics Education Foundation as well as donations from 22 U.S. companies. Depending on the amount of money contributed, U.S. corporate sponsors receive a variety of benefits such as copies of research papers by the AEA Fellows and access to resumes of past and current AEA Fellows who are interested in industry employment upon their return from Japan. In addition, beginning this year the NSF is providing a two-year challenge grant for AEA's program; the amount of the grant is $50,000. By the end of 1986, a total of 20 students will have participated in the Japan Research Fellowship Program. According to AEA, there are not enough qualified students to fill the demand by Japanese firms.[26]

AEA also operates a Tokyo office in conjunction with another trade association, the Electronics Industries Association (EIA), and with assistance from the U.S. Department of Commerce.[27] The Tokyo office--known as the U.S. Electronics Industries Japan Office--recently received a 12-month grant of $200,000 from the Commerce Department to operate the office next year; total estimated expenses for operating the office are $610,000. The Tokyo office is staffed by three professionals and two support staff. Publications from the office include: the monthly Japan Newsletter; the Directory of American Electronics Companies in Japan; and Sources for Electronics Information in Japan.[28]

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[26] Telephone conversation with Jill Center, AEA, Nov. 20, 1986.

[27] The Tokyo office opened in 1984 and was operated by AEA with assistance from the Department of Commerce. Between 1984 and October 1986, AEA received $500,000 from the Commerce Department to cover approximately one-half of the operating expenses. EIA joined the effort during the summer of 1986.

[28] Telephone conversation with Brian Wynne, AEA, Dec. 2, 1986.

E. Magnetics Society

To respond to a need for early information on Japanese magnetics research, in 1985 the Magnetics Society of The Institute of Electrical and Electronics Engineers (IEEE) began translating Japanese literature on magnetics. Translations--which are performed by a Japanese company called Adex--are compiled in the monthly IEEE Translation Journal on Magnetics in Japan. Currently, there are approximately 250 subscribers. Each issue averages over 100 pages in length; the subscription cost is $550 per year with a 40 percent discount for IEEE members.

To date, the Magnetics Society is losing money on the project and the publication schedule is almost one year behind (the December 1985 issue was not released until late 1986). At a recent meeting, the Magnetics Society decided to continue the translation journal for at least a year. Since the largest cost is translation, the Society is considering reducing the quantity of material in each issue.[29]

F. Society of Automotive Engineers, Ins. (SAE)

To improve U.S. awareness of Japan's research progress in automotive engineering, in 1985 SAE released the first of a series of volumes entitled Combustion Research in Japan. Volume I, "Spark Ignition Engine Research,"[30] contains 250 abstracts from the JICST database on current spark ignition engine

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29 Telephone conversation with Stan Charap, Professor at Carnegie-Mellon University and Chairman, Publications Department of IEEE Magnetics Society, Dec. 4, 1986.

30 Society of Automotive Engineers, Inc. Combustion Research in Japan Volume I: Spark Ignition Engine Research. Prepared by the Global Competitiveness Council. SAE, Warrendale, Penn., 1985. 191 p.

research completed in Japan. The report was prepared by the Boston-based Global Competitiveness Council. The Energy Conversion and Utilization Program of the Department of Energy provided $30,000 to fund Volume I.

SAE recently has published Volume II on "Diesel Engine Research"; in 1987, the organization plans to publish two additional volumes which update and expand the information contained in the first two volumes. SAE has supplied the funding for Volumes II through IV which sell for $75 each.[31]

IV. ANALYSIS

During the past two years, several Federal agencies have increased efforts to monitor Japanese science and technology and to acquire and disseminate related literature. Among these efforts are: the JTECH program; the review of the U.S.-Japan Agreement on Cooperation in R&D in Science and Technology; and the new Commerce Department program mandated by the Japanese Technical Literature Act. In addition, several private sector organizations have instituted initiatives to improve surveillance of Japanese science and technology activities.

Since these efforts are relatively new, it is not possible to fully assess their value or success. When looked at collectively, however, these recent U.S. programs can be viewed as a step toward improving methods to monitor developments in Japanese science and technology. These endeavors indicate that a significant barrier to solving the problem--the "not-invented-here" syndrome--is changing and that the momentum for action is building. Further, given the diversity of players with varying interests and needs in this area,

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31 Telephone conversation with Bruce Rubinger, Global Competitiveness Council, Dec. 17, 1986.

multifaceted solutions to this issue could well be the best approach. A question currently facing policymakers is whether and how to maintain or expand these emerging efforts--and institute new ones as needed--to continue this momentum and to increase the effectiveness of these Japanese monitoring activities.

On a functional level, the Federal government might play several additional roles in facilitating efforts to monitor Japanese science and technology and disseminate literature. For example, it appears evident that a major problem is a very limited number of American scientists and engineers that are fluent in Japanese. The government could consider providing incentives for Japanese language study by engineering and science students since a shortage of qualified technical translators remains a significant barrier to solving many of the problems in this area.

The government also could consider the relative benefits of providing funds for research fellowships in Japan and for increased exchange of scientists and engineers. In addition, Federal agencies could maker greater efforts to overcome barriers to broader dissemination of data on Japanese science and technology that already is available. One example is the copyright restriction on FBIS' Japan Report: Science and Technology. The government also could conduct a review of classified material gathered by various Federal intelligence agencies to determine if portions of these data could be unclassified and distributed.

There may also be a need for Federal agencies to coordinate these various monitoring efforts to avoid duplication and to ensure that the greatest benefit is gained from limited resources. The Japanese Technical Literature Act directs the Commerce Department to institute such coordination and may provide the mechanism for this activity. In addition, Federal agencies could examine

and assess the various methodologies--such as exchange programs of students and researchers, gaining access to Japanese databases, and establishing "listening posts" in Japan--currently being used to monitor Japanese science and technology. Such an analysis is needed to determine which methods are most effective in surveillance activities and where Federal efforts and support should be focused. This is particularly important given Japan's increased spending on research and development and the large volume of their scientific and technical literature.

At a recent workshop sponsored by the Office of Naval Research and NSF,[32] experts discussed short- and long-term options to improve monitoring of science and technology in Western Europe and Japan. Participants included experts in the fields of ceramics, electronics, and biotechnology from industry, government, and academia.[33] Since this meeting constituted the most recent gathering of individuals and organizations with a continuing interest in this area, a summary of the findings and recommendations is presented.

At the beginning of the workshop, the attendees identified several underlying themes. The participants agreed that "paper is fine, but people are better," a reference to the idea that there is a critical need for increased personal contacts by U.S. scientists and engineers with their Japanese counterparts. In addition, the participants found that: there is too much

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[32] U.S. Office of Naval Research and the National Science Foundation. Defining U.S. Needs to Monitor Foreign Science and Technology for Greater International Competitiveness. Workshop held Oct. 5-7, 1986 at SRI International, Arlington, Va. [Unpublished].

[33] The workshop organizers asked the participants to accept as a given that the Japanese language is extremely difficult and that improving language capability is long-term and uncertain. With this understanding, the experts were requested to focus their attention on how to utilize limited resources by determining: what information is most important; who needs information about foreign science and technology and what is the demand; and what immediate concrete options are available. Workshop Plan, p. 8.

attention to acquiring Japanese scientific and technical information and not enough to selecting and analyzing quality material from an ever-increasing volume of data; and there is gap between the quantity of Japanese scientific and technical information and its utilization.

The workshop reached several general conclusions regarding options to improve surveillance of foreign science and technology, with particular emphasis on Japan. Richard J. Samuels of the Massachusetts Institute of Technology (MIT)-Japan Science and Technology Program summarized these alternatives.

The short-term options to improve monitoring of foreign science and technology include the following.

- o Create better dissemination channels, emphasizing data on early diagnostic material and current research;
- o Encourage more systematic sharing of trip reports;
- o Create directories of individuals who have traveled to Japan;
- o Encourage U.S. visitors to Japan to write articles for publication; and
- o Include monies for foreign travel in grants from U.S. science agencies.

The long-term options include the following.

- o Begin language training at primary and secondary school levels;
- o Encourage foreign area expertise in postsecondary and graduate level education programs;
- o Support consortia (similar to the Rutgers University ceramics program that receives support from state government, the university, industry as well as NSF) that incorporate monitoring of foreign science and technology and disseminating data; and
- o Establish new databases which include information on who has traveled to and/or studied in Japan along with their area of research expertise.

In addition to these options, several institutional responsibilities were outlined. For example, industry needs to establish more foreign offices or "listening posts" similar to the AEA office in Tokyo. Universities need to

provide incentives for foreign sabbaticals and for foreign study by post-doctoral students. In addition, universities could seek private sector endowment of programs for applied foreign studies which would include language study; one model for such programs is the MIT-Japan Science and Technology Program.

There were also several recommendations concerning the role of the Federal government. For example, funding was urged to: train a new generation of scientists and engineers in the Japanese language; assist trade associations in establishing foreign offices and monitoring foreign trade shows; increase exchange programs by science agencies; and assist in the formation of university/industry/government consortia at the state level. In addition, the participants stressed that there is a need for coordination of existing Japanese monitoring activities by Federal agencies.

V. CONCLUSION

In recent years, the Federal government and the private sector have responded to continuing competitive advances by Japan in science and technology by expanding efforts to monitor these developments and to acquire and disseminate related literature. Perhaps the most significant of the Federal efforts is the Commerce Department program mandated by the Japanese Technical Literature Act. The provisions of the law have the potential to significantly improve and coordinate Federal efforts in this area. It will be important, however, for Congress to provide continuing oversight to ensure that the Department does not lag in implementing the law and to determine the effectiveness of the program and whether greater funding is needed.

Since these efforts are relatively new, it is not possible to fully assess their value or success. Collectively, these programs represent a significant stride toward improving U.S. surveillance of Japanese science and technology. There are still areas, however, where options might be considered for an increased Federal role in overcoming barriers to monitoring Japanese science and technology and acquiring related literature. In particular, for the long-term a case can be argued for stimulating Japanese language study by science and engineering students and to provide greater opportunities to students and researchers for travel and study in Japan. In the short-term, Federal agencies could make greater efforts to disseminate existing data on Japanese science and technology to a broader audience. In addition, Federal agencies need to coordinate the various Japanese monitoring activities to avoid duplication and to ensure that the greatest benefit is derived from limited resources.

Improving access to Japanese scientific and technical literature will be expensive. Therefore, policymakers will need to consider existing private sector activities--as well as steps taken by Japan to make their scientific and technical information more available to the English-speaking world--when determining the appropriate Federal role. Finally, since observers have not yet reached agreement on exactly how to improve such access and on what kinds of material should be made available, continued analysis and assessment of programs and activities may be necessary.